Remarks/Arguments

Background

Applicants acknowledge with appreciation the withdrawal of the rejections presented in the previous Office Action. For reasons discussed hereafter, applicants contend that the pending claims are patentable over the newly presented rejections.

The Invention

The present invention is based on the surprising discovery that the addition of a small amount of a protein additive into a UF-resin binder for making non-woven, wet-laid fiber mats, especially a wet laid fiberglass mat, has a similar strength enhancing effect as the prior discovered addition of a styrene-maleic anhydride (SMA) copolymer to such binders (see U.S. Patents 5,914,365 and 6,084,021) and further that the additive combination of both protein and SMA is particularly and unexpectedly advantageous in such applications.

Response to Rejections

Reconsideration and allowance are respectfully requested in light of the following remarks.

Claims 7-9 and 11-13 stand rejected under 35 USC 103(a) as being unpatentable over Belmares et al., U.S. Pub 2003/0099850 (Belmares) in view of Chan et al. US 6,384,116 (Chan). This rejection is respectfully traversed.

Belmares describes including a polymeric polyamide scavenger comprising a formaldehyde reactive material into a U-F resin-based coating formulation for a panel or a board in order to reduce the formaldehyde emissions of the cured coating formulation. The sole purpose of the additive is to reduce formaldehyde emissions in such panels and boards without significantly sacrificing the inherent strength of the panel, as occurs when using small molecule scavengers like urea in the coating formulation.

The polyamide scavenger is a polymeric formaldehyde reactive material selected from synthetic or natural polyamides or combinations of the two. The synthetic polyamides may be selected from the group of polyacrylamides, polymethacrylamides,

polyamide telomers, copolymers, terpolymers, tetrapolymers, and N-substituted polyamides. The natural polyamides include proteins, such as casein or soy protein.

Belmares also suggests that the formulation also can be used as a binder for making composite panels.

Belmares does not make it obvious to use what is a significantly lower amount of protein (0.1% to 10% by weight in claim 7 and 0.2% to 7% by weight in claim 11) in a binder for manufacturing a non-woven, wet laid fiber mat and Chan does not remedy any of Belmares' deficiencies.

In the case of protein polyamide scavengers, Belmares indicates that the effective ranges of this material are from 5% to about 50%, from about 10% to about 40% and from 20% to 30% (Paragraph [0023]), dry weight of scavenger per dry weight of formaldehyde resin). Thus, while Belmares, in its broadest aspect, contemplates an addition level in the range of 5 to 50% for its protein formaldehyde scavenger used in the manufacture of panels and boards, the teachings clearly suggest that levels above 10% and especially above 20% are preferred. Consistent with this clear suggestion in the direction of higher levels of scavenger, in the illustrative examples, the polymeric additive, especially the protein additive, is used in an amount of 25% (by weight) of the formaldehyde resin.

Consequently, a skilled worker would not have found it obvious to use protein as an additive in a significantly different application (that is in the manufacture of a wet-laid, non-woven glass mat versus the preparation of a composite board or panel) and at a level of addition below what Belmares prefers and at the lower end of Belmares' broadest taught range, with a reasonable expectation that one would obtain improved strength characteristics in the glass mat based on the addition of that small amount of protein.

In this regard, applicants refer the Examiner to the previously cited Chang reference, WO 98/34885 (corresponds to U.S. Patents 5,914,365 and 6,084,021).

As noted in applicants' prior response, Chang is directed to the preparation of non-woven wet-laid fiber mats, just as is the present invention. Chang says nothing about protein addition and has no teaching that would in any way suggest that the addition of a protein to a non-woven, wet-laid fiber mat binder would provide any benefit whatsoever. Chang does show, however, that the addition of a small amount of SMA copolymer to a

UF resin binder, conventionally used to make glass fiber mats, has a significant improving effect on the Dry and Hot-wet tensile properties of the mat. Indeed, that was the basis on which the Chang patents were granted.

Surprisingly, the data in Tables 1, 2 and 3 of applicants pending application demonstrate that a minor level of protein addition to the binder resin can replace all or a part of the SMA additive with equivalent strength results for the mat. Thus, when the information in Chang is coupled with the data in the pending application, one skilled in the art immediately recognizes the significant strength improvement one achieves upon using such a small amount of protein as an additive in a conventional UF resin adhesive binder for wet laid fiber mats.[1]

The Office Action asserts that it would have been obvious for an ordinary skilled worker "to modify the article of Belmares et al. based on Chan and provide it with a binder composition comprising urea-formaldehyde modified with a water-soluble non-ionic amine oxide and optionally further modified with an acrylic latex with the motivation of improving the acoustic insulation panel with improved tensile strength." While applicants do not agree that an ordinary skilled worker would be motivated to make such an alteration in Belmares, applicants fail to see the relevance of this contention to the patentability of the pending claims if such a modification were to be made. The pending claims do not embrace the manufacture of boards or panels. No modification of Belmares, other than a radical modification that completely changes Belmares purpose and focus, would even remotely approach the subject matter defined by the pending claims.

The Office Action also takes the position that Belmares and Chan are from the same field of endeavor. This is NOT the case.

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1 A binder based on SMA plus a conventional UF resin provides unexpectedly superior mat strength properties versus a binder based on a conventional UF resin alone (Chang). A binder based on soy protein and a conventional UF resin provides similar mat strength properties as a binder based on SMA and a conventional UF resin (data in Table 1, 2 and 3 of the pending application). Therefore, one understands that a binder based on soy protein and a conventional UF resin will provide unexpectedly superior mat strength properties versus a binder based on a conventional UF resin alone.

While Chan and the previously cited reference to Chang (WO 98/34885) each relate to the preparation of wet laid mats using glass fibers, as noted above the primary Belmares reference does not. Rather, Belmares' teachings are directed to the preparation of composite panels, particle board and plywood. Applicants do not agree that Belmares and Chan are from the same field of endeavor. Indeed, the respective fields of endeavor are so disparate that a skilled worker would not have a reasonable expectation that techniques and compositions relevant to one application would be applicable to the other.

The relevant definitions of a board (www.dictionary.com) include:

A long flat slab of sawed lumber; a plank, and

A flat piece of wood or **similarly rigid material** adapted for a special use (emphasis added).

A composite board would thus be a flat piece of rigid material made from a mixture of constituents

The relevant definitions of a mat, in contrast, (again www.dictionary.com) include:

A densely woven or thickly tangled mass: *a mat of hair.*

As is apparent from these definitions, these words do not refer to equivalent structures. Indeed, a wet laid, non woven fiber mat is structurally very different from the composite panels and boards embraced by Belmares. The panels and boards described by Belmares are prepared by consolidating the board ingredients under heat and considerable compaction pressure (though we note that Belmares' teachings regarding the formation of the boards and panels is sorely lacking). In contrast, the wet laid mats of the present invention are for the most part un-compacted, relying mainly on the dewatering of an aqueous fiber slurry to cause mat formation. A skilled worker simply would not find the teachings of Belmares aimed at composite panels and boards analogous to the very different wet laid mat technology to which the pending claims are directed.

For that reason a skilled worker would not be lead to combine the teachings of Belmares with those of Chan. However, even if a skilled worker were to consider the separate teachings in combination, that worker would not be led to the fiber mat product embraced by the pending claims. While Belmares broadly discloses a broad range for the content of a protein scavenger, the obvious implication is that to do a good job of

scavenging formaldehyde, more scavenger is better. Contrary to that clear implication, applicants discovered that in connection with the manufacture of a wet laid, non woven glass fiber mat, unexpected improvements in mat strength characteristics can be obtained by using a small amount of a protein, especially a soy protein. Indeed, as shown in Examples 1 and 2, and the data in Tables 1, 2 and 3, a small amount of soy protein can be used in place of the much more expensive SMA copolymer while yielding equivalent, if not superior, mat strength characteristics. Nothing in Belmares or Chan makes that surprising discovery obvious.

Claims 10 stands rejected under 35 USC 103(a) as being obvious over Belmares in view of WO 01/59026 to Trocino (Trocino). This rejection is respectfully traversed.

Belmares has been discussed above and no further discussion is needed.

Trocino describes making a protein-based adhesive by functionalizing a denatured (hydrolyzed) vegetable protein with methylol groups (e.g., treat the protein with formaldehyde), and then reacting the functionalized protein with a co-monomer having methylol groups (e.g., dimethylolurea or dimethylolphenol). Like Belmares, Trocino uses the adhesive in the formation of composite boards, unlike Belmares, Trocino uses the functionalized soy component as the major constituent of the binder (in the examples the soy protein was 50% or more of the adhesive solids – this is far removed from the upper limit of 10% embraced by the pending claims).

This rejection fails to provide an appropriate basis for combining these references. In Belmares, the protein is added solely as a formaldehyde scavenger. In Trocino, the protein is the main structural constituent of the adhesive formulation. A skilled worker would not consider the teachings of Trocino in connection with Belmares. The only similarity between the two is that they both relate to the making of composite boards. However, this similarity constitutes one of the main distinctions between these references and the pending claims. As noted above, a skilled worker would not consider teachings directed to composite panels and boards to have any relevance for non-woven, wet laid fiber mats. Trocino also is a non-analogous reference.

On the basis of the foregoing, the rejections of the claims under 35 U.S.C. §103(a) are improper and the rejections should be withdrawn. Reconsideration and the allowance of the pending claims are thus respectfully requested.

Respectfully submitted,

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Dated: November 2, 2005

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